REMARKS

Claims 1, and 3-33 are pending. Claim 2 has been canceled without prejudice to or disclaimer of the subject matter of the claims. Claims 1, 3, 4, 7-9, 11, 13, 16, 18-21, and 23-29 have been amended. The specification has been amended to add reference characters identified in FIGS. 16 and 21. Applicants respectfully request reconsideration of the application in response to the non-final Office action.

Allowable Subject Matter

Claims 4, 9-15, 19-20, 26-27, and 29 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants gratefully acknowledge the indication of the allowable subject matter. Based on at least the arguments submitted below, however, Applicants believe claims 4, 9-15, 19-20, 26-27, and 29 are allowable in their present form and have therefore elected not to rewrite the objected to claims in independent form at this time.

Objections to the Drawings

The drawings have been objected to as failing to comply with 37 C.F.R. §1.84(p)(5) because FIGS. 16 and 21 include reference characters (elements 1610 and 2140, respectively) not mentioned in the description. Applicants have amended the specification to add the reference characters in the description in compliance with 37 C.F.R. § 1.121(b). Accordingly, Applicants respectfully request that the objection to the drawings be withdrawn.

Claim Rejections Under 35 U.S.C. §102

Prevost

Claims 1, 2, 6 and 30 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,123,084 to Prevost *et al.* ("Prevost"). Applicants respectfully traverse the rejection.

Claim 1 as amended, recites, among other features, "generating three-dimensional object data using a three-dimensional bounding volume to convert the three-dimensional object data into voxel data, wherein the voxels are differentiated based on whether they are located where objects exist or in a background," and "representing the voxel data by a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types, the types comprising nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background."

As described in the specification of the instant application, the attached labels indicating the different types of nodes can be used to merge nodes of the tree structure. (Specification at page 11, lines 10-12). In particular, nodes with labels indicating nodes having sub-nodes and nodes at the predetermined depth having voxels located where objects exist and in the background can be selected as candidates to be merged. (Specification at page 11, lines 14-16).

Prevost describes an octree structure of three-dimensional data and three values for representing the status of each node: 'E' to represent an empty node, 'P' to represent a partial node, and 'F' to represent a full node. (Prevost at col. 3, line 51 to col. 4, line 3). Prevost does not, however, describe a value representing nodes

having sub-nodes and a value representing nodes at a predetermined depth of the octree having voxels located where objects exist and in the background. As described above, identifying with respective labels the types of nodes recited in claim 1 is significant for using the labels to merge the nodes of the tree structure, where nodes having sub-nodes and nodes at the predetermined depth having voxels located where objects exist and in the background can be selected as candidates to be merged. Because Prevost does not describe identifying with respective labels all of the types of nodes recited in claim 1, Prevost does not anticipate claim 1.

Accordingly, for at least these reasons, Applicants respectfully request that the §102(b) rejection of claim 1 and of all claims depending therefrom (i.e., claims 2, 6, and 30) in light of Prevost be withdrawn.

Samet

Claims 7, 16, and 17 have been rejected under 35 U.S.C. §102(a) as being anticipated by "Octree Approximation and Compression Methods," *Proceedings of First International Symposium on 3D Data Processing Visualization and Transmission*, IEEE Computer Society, pp. 1-10 (June 2002) to Samet *et al.* ("Samet"). Applicants respectfully traverse the rejection.

Claim 7 as amended, recites, among other features, "(a) generating three-dimensional object data having a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types, the types comprising nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth

having voxels located where objects exist and in the background," and "(b) merging the nodes of the three-dimensional object data by referring to their labels."

As described in the specification of the instant application, the attached labels indicating the different types of nodes can be used to merge nodes of the tree structure. (Specification at page 11, lines 10-12). In particular, nodes with labels indicating nodes having sub-nodes and nodes at the predetermined depth having voxels located where objects exist and in the background can be selected as candidates to be merged. (Specification at page 11, lines 14-16).

Samet describes defining an octree by enumerating the locational codes of all of its WHITE nodes (denoting voxels not occupied by objects), or all of its BLACK nodes (denoting voxels occupied by objects), and encoding the octree using an approximation method. (Samet at page 5, section 3, first paragraph). In particular, Samet describes forest-based approximation methods in which nodes are labeled 'GB' if at least four of its children are black or of type 'GB,' and are otherwise labeled 'GW.' (Samet at page 3, section 2.2, first paragraph). Samet, however, does not describe labeling the same types of nodes recited in claim 7.

For example, Samet does not describe labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background. As described above, identifying with respective labels the types of nodes recited in claim 7 is significant for using the labels to merge the nodes of the tree structure, where nodes having sub-nodes and nodes at the predetermined depth having voxels located where objects exist and in the background can be selected as candidates to be merged. Because Samet does

not describe identifying with respective labels all of the types of nodes recited in claim 7, Samet does not anticipate claim 7.

Accordingly, for at least these reasons, Applicants respectfully request that the §102(a) rejection of claim 7 and of all claims depending therefrom (i.e., claims 16 and 17) in light of Samet be withdrawn.

Claim Rejections Under 35 U.S.C. §103

Claims 18, 21, 22, and 31

Claims 18, 21, 22, and 31 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Samet as applied to claim 7. Applicants respectfully traverse the rejection.

Clam 18 as amended, recites, among other features, "a tree structure generator which generates three-dimensional object data having a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types, the types comprising nodes having sub-nodes, nodes having all voxels located in a background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background." For at least the reasons described above with respect to claim 7, Samet does not render claim 18 obvious.

At a minimum, Samet does not describe labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background. Instead, Samet describes labeling nodes

'GB' if at least four of its children are black or of type 'GB,' and otherwise labeling nodes 'GW.' (Samet at page 3, section 2.2, first paragraph).

Accordingly, for at least these reasons, Applicants respectfully request that the §103(a) rejection of claim 18 and of all claims depending therefrom (i.e., claims 21 and 22) in light of Samet be withdrawn. Similarly, for at least these reasons described above with respect to claim 7, Applicants respectfully request that the §103(a) rejection of claim 31, which depends from claim 7, in light of Samet be withdrawn.

Claim 8

Claim 8 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Samet as applied to claim 7, and further in view of "Implementing the PPM data compression scheme," *IEEE Transactions on Communications*, Vol. 38, No. 11, pp. 1917-1921 (1990) to Alistair Moffat ("Moffat"). Applicants respectfully traverse the rejection.

For at least the reasons described above, Applicants submit that Samet does not render claim 7 obvious and that Moffat does not supply the teachings missing from Samet. At a minimum, neither Samet nor Moffat describes labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background, as recited in amended claim 7. In particular, while Moffat describes a PPM compression scheme for high performance data compression for text files, nowhere does Moffat describe using a PPM algorithm to encode nodes at the predetermined depth of a tree structure of

three-dimensional object data whose voxels are located where objects exist and in the background, as recited in claim. (See, Moffat at Abstract and page 1917, Introduction, third paragraph). Accordingly, for at least these reasons, Applicants respectfully submit that the §103(a) rejection of claim 8, which depends from claim 7, in light of Samet in view of Moffat be withdrawn.

Claims 24, 28 and 33

Claims 24, 28 and 33 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Prevost as applied to claim 1. Applicants respectfully traverse the rejection.

Claim 24 as amended, recites, among other features, "decoding nodes of a bitstream of encoded three-dimensional object data, comprising decoding node type information of the bitstream, wherein the node type information describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background." For at least the reasons described above with respect to claim 1, Applicants submit that Prevost does not render claim 24 obvious.

At a minimum, nowhere does Prevost describe node type information that describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background, as recited in claim 24. Accordingly, Applicants respectfully submit that the §103(a) rejection of claim 24, and of all claims depending therefrom (i.e., claim 33) in light of Prevost be withdrawn.

Claim 28 as amended, recites, among other features, "a node decoder which decodes the bitstream, the node decoder comprising a node type selector which decodes node type information of the bitstream, wherein the node type information describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background." For at least the reasons described above with respect to claims 1 and 24, Applicants submit that Prevost does not render claim 28 obvious.

At a minimum, nowhere does Prevost describe node type information that describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background, as recited in claim 28. Accordingly, Applicants respectfully submit that the §103(a) rejection of claim 28 in light of Prevost be withdrawn.

Claim 5

Claim 5 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Prevost as applied to claim 1, and further in view of Samet. Applicants respectfully traverse the rejection.

For at least the reasons described above, Applicants submit that Prevost does not render claim 1 obvious and that Samet does not supply the teachings missing from Prevost. At a minimum, neither Prevost nor Samet describes representing the voxel data by a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types, the types including, among other types, nodes having sub-nodes and nodes at the predetermined depth having voxels located where objects exist and in the background, as recited in claim 1.

Accordingly, Applicants respectfully submit that the §103(a) rejection of claim 5, which depends from claim 1, in light of Prevost in view of Samet be withdrawn.

Claims 3, 23, 25, and 32

Claims 3, 23, 25, and 32 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Prevost as applied to claims 1, 2, and 24, in view of Samet and Moffat. Applicants respectfully traverse the rejection.

For at least the same reasons described above with respect to claim 1, Applicants submit that Prevost does not render claim 3 obvious and that Samet and Moffat do not supply the teachings missing from Prevost. At a minimum, neither Prevost, Samet, nor Moffat describes representing the voxel data by a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types, the types including, among other types, nodes having sub-nodes and nodes at the predetermined depth having voxels located where objects exist and in the background, as recited in amended claim 1. Additionally, while Moffat describes a PPM compression scheme for high performance data compression for text files, nowhere does Moffat describe using a PPM algorithm to encode 'P' nodes, which include nodes at the predetermined depth of a tree structure of three-dimensional object data whose voxels are located where objects exist and in the background, as recited in claim 3, as amended. (See, Moffat at Abstract and page 1917, Introduction, third paragraph).

Accordingly, Applicants respectfully submit that the §103(a) rejection of claim 3, which depends from claim 1, in light of Prevost in view of Samet and Moffat be withdrawn.

Claim 23 as amended, recites, among other features, "decoding node type information of the bitstream, comprising decoding an 'S' node if the node type information indicates that a current node is a node having sub-nodes and decoding a 'P' node if the node type information indicates that the current node is a node at a predetermined depth of a tree structure having voxels located where objects exist and in a background." For at least the same reasons described above with respect to claim 1, Applicants submit that Prevost does not render claim 23 obvious and that Samet and Moffat do not supply the teachings missing from Prevost.

At a minimum, neither Prevost, Samet, nor Moffat describes decoding an 'S' node if the node type information indicates that a current node is a node having sub-nodes and decoding a 'P' node if the node type information indicates that the current node is a node at a predetermined depth of a tree structure having voxels located where objects exist and in a background, as recited in amended claim 23. Furthermore, amended claim 23, no longer recites the PPM algorithm, rendering the applicability of Moffat moot.

Accordingly, Applicants respectfully submit that the §103(a) rejection of claim 23, and of all claims depending therefrom (i.e., claim 32) in light of Prevost in view of Samet and Moffat be withdrawn.

Similarly, for at least the same reasons described above with respect to claim 24, Applicants submit that Prevost does not render claim 25 obvious and that Samet and Moffat do not supply the teachings missing from Prevost. At a minimum, neither Prevost, Samet, nor Moffat describes decoding node type information of the bitstream, the node type information describing nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects

exist and in a background, as recited in amended claim 24. Additionally, while Moffat describes a PPM compression scheme for high performance data compression for text files, nowhere does Moffat describe using a PPM algorithm to decode 'P' nodes, which include nodes at the predetermined depth of a tree structure of three-dimensional object data whose voxels are located where objects exist and in the background, as recited in claim 25, as amended. (See, Moffat at Abstract and page 1917, Introduction, third paragraph).

Accordingly, Applicants respectfully submit that the §103(a) rejection of claim 25, which depends from claim 24, in light of Prevost in view of Samet and Moffat be withdrawn.

CONCLUSION

Applicants have noted significant differences between the disclosures of Prevost, Samet, and Moffat and the present application and, as a result, have provided reasoned arguments as to why the elements of the claims of the present application are not disclosed by or rendered obvious thereby.

It is believed that this Response and Amendment requires no fee. However, if fees are required for any reason, please charge Deposit Account No. 02-4800 the necessary amount.

In the event that there are any questions concerning this paper, or the application in general, the Examiner is respectfully urged to telephone Applicants' undersigned representative so that prosecution of the application may be expedited.

Respectfully submitted,

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